

CLAIMS

What is claimed is:

- 5 1. In a computer system, a method for establishing a packet communications sessions to a data storage system, the method comprising the steps of:

receiving a request to establish a communications session with a data storage system;

10 establishing a first packet communications session from the computer system to a data communications device capable of communicating with the data storage system;

establishing a second packet communications session from the data communications device to a service processor associated with the data storage system; and

15 performing packet communications between the computer system and the service processor associated with the data storage system using the first and second packet communications sessions.

2. The method of claim 1 wherein the step of receiving a request to establish a communications session with a data storage system comprises the steps of:

20 receiving user authentication information for a user of the computer system; authenticating an identity of the user based on the user authentication information; receiving a data storage system identity indicating an identity of the data storage system to which the packet communications session is to be established.

- 25 3. The method of claim 2 wherein:

the request to establish a communications session with a data storage system includes the identity of the data storage system to which a communications session is to be established; and

wherein the identity specifies at least one of

- i) a phone number of a service processor modem associated with the data storage system;
- ii) a serial number of the data storage system; and
- iii) customer information related to a customer operating the data storage system.

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4. The method of claim 2 wherein the step of receiving data storage system identity information comprises the steps of:

receiving data storage system search criteria;

10 providing data storage system search criteria to a connection monitor computer system to produce a set of data storage system identities that meet the data storage system search criteria; and

receiving the set of data storage system identities that meet the data storage system search criteria; and

15 allowing the user to select at least one data storage system identity from the set of data storage system systems.

5. The method of claim 4 wherein:

the data storage system search criteria is received from at least one of:

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i) a user of the computer system;

ii) a service ticket identifying a data storage system;

the data storage system search criteria includes at least a portion of the user authentication information; and

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the set of data storage system identities that meet the data storage system search criteria includes identities of data storage systems to which a user identified by the portion of the user authentication information is allowed to establish a packet communications session.

6. The method of claim 1 wherein the step of establishing a first packet communications session from the computer system to a data communications device capable of communicating with the data storage system comprises the steps of:

obtaining connection information for a data communications device that is

5 capable of communicating with the data storage system;

initiating the first packet communications session from the computer system to a data communications device using the connection information for the data communications device;

providing, to the data communications device, first packet communications

10 session authentication information such that the data communications device can determine if a user of the computer system is authorized to establish the first packet communications session; and

15 if the user of the computer system is authorized to establish the first packet first packet communications session, allowing the computer system to perform the step of establishing a second packet communications session from the data communications device to the data storage system; and

if the user of the computer system is not authorized to establish the first packet first packet communications session, denying the ability of the computer system to perform the step of establishing a second packet communications session from the data 20 communications device to the data storage system.

7. The method of claim 6 wherein the step of obtaining connection information for the data communications device comprises the steps of:

providing, to a connection monitor computer system, a request for an address of a

25 data communications device, the request including data communications device selection criteria allowing the connection monitor computer system to select and return an address of an available data communications device that is authorized to establish the second packet communications session to the data storage system; and

receiving the address of the data communications device selected by the

30 connection monitor computer system.

8. The method of claim 7 wherein the request for an address of the data communications device includes at least one of:

i) a portion of the user authentication information;

5 ii) customer information concerning a customer operating the data storage system;

and

iii) connection information associated with the data storage system; and

wherein the connection monitor computer system compares the request for an address against user and customer data to determine what data storage systems a user providing the request is allowed to access.

10 9. The method of claim 6 wherein:

the step of initiating the first packet communications session establishes an internet protocol communications session between the computer system and the data communications device; and

15 wherein the step of providing, to the data communications device, first packet communications session authentication information passes user authentication information from the computer system to the data communications device to allow the data communications device to authorize the internet protocol communications session.

20 10. The method of claim 9 wherein the step of providing, to the data communications device, first packet communications session authentication information causes the data communications device to communicate with an user account computer system to verify if the user of the computer system identified in the user authentication information is  
25 authorized to cause the data communications device to establish the first and second packet communications sessions from the computer system, through the data communications device, to the data storage system.

11. The method of claim 1 wherein the step of establishing a second packet communications session from the data communications device to the data storage system comprises the steps of:

providing, to the data communications device, second packet communications

5 session connection information allowing the data communications device to initiate the second packet communications session from the data communications device to the data storage system;

receiving second packet communications session state information indicating a state of the second packet communication session between the data communications 10 device and the data storage system.

12. The method of claim 11 wherein:

the second packet communications session connection information includes data storage system connection information associated with the data storage system and user authentication information of the user of the computer system; and

wherein the step of providing the second packet communications session connection information to the data communications device causes the data communications device to perform the steps of:

initiating the second packet communications session from the data

20 communications device to the data storage system using the data storage system connection information;

providing the user authentication information to a remote access server associated with the data storage system to allow the remote access server to authorize the establishment of the second packet communications session from the data communications device to the data storage system;

25 receiving data storage system address information at the data communications device identifying an address of the data storage system to allow the data communications device to establish the second packet communications session; and

forwarding second packet communications session state information to the computer system from the data communications device to allow the computer system to perform the step performing packet communications between the computer system and data storage system using the first and second packet communications sessions.

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13. The method of claim 12 wherein the data storage system address information is a pre-configured network address assigned to the service processor associated with the data storage system.

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14. The method of claim 12 wherein:

the second packet communications session connection information includes data storage system connection information including an a phone number of a service processor modem associated with the service processor associated with the data storage system; and

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wherein the step of initiating the second packet communications session from the data communications device to the data storage system causes the data communications device to instruct a modem to dial the phone number of a service processor modem in order to establish a dial up connection to the data storage system from the data communications device.

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15. The method of claim 12 wherein:

the second packet communications session state information includes the data storage system address information and includes data storage system connection bandwidth information; and

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wherein the step of forwarding second packet communications session state information to the computer system from the data communications device causes the data communications device to perform the step of:

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forwarding the second packet communications session state information to a network manager computer system which receives the second packet communications

session state information and forwards routing information to the computer system so that the computer system can perform packet communications with the data storage system.

16. The method of claim 12 wherein the step performing packet communications

5 between with the computer system and the service processor associated with the data storage system comprises the steps of:

receiving the second packet communications session state information in response to the step of forwarding;

10 adjusting connection bandwidth associated with the first packet communications session to match connection bandwidth associated with the second packet communications session;

15 providing computer system address information to the data storage system so that the data storage system can establish a route to the computer system; and

20 using the first packet communications session between the computer system and the data communications device and the second packet communications session between the data communications device and the service processor associated with the data storage system to perform packet communications between the computer system and the service processor associated with the data storage system.

25 17. The method of claim 1 wherein the step of receiving a request to initiate a

communications session with the data storage system further comprises the steps of:

receiving a service ticket from the data storage system; and

25 analyzing the service ticket to determine an identity of the data storage system to which a packet communications session is to be established from the computer system.

30 18. The method of claim 1 wherein the steps of establishing a first packet communications session, establishing a second packet communications session and performing packet communications are performed using secure and authenticated communications sessions.

19. In a processor in a data storage system, a method for establishing a packet communications session with a computer system, the method comprising the steps of:

receiving a request to initiate a packet communications session;

providing data storage system address information to an initiator of the request;

receiving computer system address information to allow the processor in the data storage system to perform packet communications with the computer system; and

establishing a packet communications session with the computer system based on the computer system address information.

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20. The method of claim 19 wherein:

the request to initiate a packet communications session includes user authentication information of a user of the computer system; and

wherein the method further comprises the step of authenticating an identity of the user based on the user authentication information in order to authorize the establishment of the packet communications session to the data storage system.

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21. The method of claim 20, further comprising the steps of:

in response to the step of authenticating an identity of the user, the processor establishes a packet communications session with a data communications device from which the request to initiate a packet communications session originates.

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22. The method of claim 21 wherein the processor is a service process in the data storage system and the data storage system address information is a pre-configured network address assigned to the service processor associated with the data storage system by a vendor of the data storage system.

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23. The method of claim 19 wherein:

the request to initiate a packet communications session is sent from a data communications device interconnected with the computer system; and

wherein the step of providing data storage system address information provides a network address of the processor in the data storage system to the data communications device for receipt by the computer system to allow the computer system to perform packet communications to the data storage system.

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24. The method of claim 19 wherein the step of establishing a packet communications session with the computer system establishes route information within the data storage system based on the computer system address information to allow the processor to perform packet communications with the computer system.

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25. A computer system comprising:

a processor;

an input-output mechanism;

an interface capable of coupling to a computer network;

a memory system encoded with a connection application;

an interconnection mechanism coupling the processor, the interface and the memory system;

wherein, the processor performs the connection application as a connection process which causes the computer system to establish a packet communications sessions to a data storage system by performing the operations of:

receiving a request to establish a communications session with a data storage system;

establishing a first packet communications session from the computer system to a data communications device on the computer network capable of communicating with the data storage system on the computer network;

establishing a second packet communications session from the data communications device to a service processor associated with the data storage system on the computer network; and

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performing packet communications via the interface on the computer network between with the computer system and data storage system using the first and second packet communications sessions.

- 5 26. The computer system of claim 25 wherein when the connection process performs the operation of receiving a request to establish a communications session with a data storage system, the connection process causes the computer system to perform the operations of:  
receiving, via the input-output mechanism, user authentication information for a user of the computer system;

10 authenticating an identity of the user based on the user authentication information;

15 receiving, via the input-output mechanism, a data storage system identity indicating an identity of the data storage system to which the packet communications session is to be established.

- 20 27. The computer system of claim 26 wherein:

the request to establish a communications session with a data storage system includes the identity of the data storage system to which a communications session is to be established; and

wherein the identity specifies at least one of

- 25 i) a phone number of a service processor modem associated with the data storage system;  
ii) a serial number of the data storage system; and  
iii) customer information related to a customer operating the data storage system.

28. The computer system of claim 26 wherein when the connection process performs the operation of receiving data storage system identity information, the connection process causes the computer system to perform the operations of:

receiving, via the input-output mechanism, data storage system search criteria;

providing, via the interface, data storage system search criteria to a connection monitor computer system to produce a set of data storage system identities that meet the data storage system search criteria; and

5 receiving, via the interface, the set of data storage system identities that meet the data storage system search criteria; and

allowing the user to select, via the input-output mechanism, at least one data storage system identity from the set of data storage system systems.

29. The computer system of claim 4 wherein:

10 the data storage system search criteria is received from at least one of:

- i) a user of the computer system;
- ii) a service ticket identifying a data storage system;

the data storage system search criteria includes at least a portion of the user authentication information; and

15 the set of data storage system identities that meet the data storage system search criteria includes identities of data storage systems to which a user identified by the portion of the user authentication information is allowed to establish a packet communications session.

20 30. The computer system of claim 25 wherein when the connection process causes the computer system to perform the operations of establishing a first packet communications session from the computer system to a data communications device capable of communicating with the data storage system, the connection process causes the computer system to perform the operations of:

25 obtaining connection information for a data communications device on the computer network that is capable of communicating with the data storage system;

initiating the first packet communications session from the computer system to the data communications device over the interface using the connection information for the data communications device;

providing, over the interface to the data communications device, first packet communications session authentication information such that the data communications device can determine if a user of the computer system is authorized to establish the first packet communications session; and

5 if the user of the computer system is authorized to establish the first packet first packet communications session, allowing the computer system to perform the operation of establishing a second packet communications session from the data communications device to the data storage system; and

10 if the user of the computer system is not authorized to establish the first packet first packet communications session, denying the ability of the computer system to perform the operation of establishing a second packet communications session from the data communications device to the data storage system.

15 31. The computer system of claim 30 wherein when the connection process causes the computer system to perform the operation of obtaining connection information for the data communications device, the connection process causes the computer system to perform the operations of:

20 providing, over the interface, to a connection monitor computer system on the computer network, a request for an address of a data communications device, the request including data communications device selection criteria allowing the connection monitor computer system to select and return an address of an available data communications device that is authorized to establish the second packet communications session to the data storage system; and

25 receiving, over the interface, the address of the data communications device selected by the connection monitor computer system.

32. The computer system of claim 31 wherein the request for an address of the data communications device includes at least one of:

i) a portion of the user authentication information;

ii) customer information concerning a customer operating the data storage system;

and

iii) connection information associated with the data storage system; and

wherein the connection monitor computer system on the computer network

- 5 compares the request for an address against user and customer data to determine what data storage systems a user providing the request is allowed to access.

33. The computer system of claim 6 wherein:

when the connection process causes the computer system to perform the operation

10 of initiating the first packet communications session, the connection process causes the computer system to perform the operation of establishing an internet protocol communications session between the computer system and the data communications device on the computer network; and

15 wherein when the connection process causes the computer system to perform the operation of providing, to the data communications device, first packet communications session authentication information, the connection process causes the computer system to perform the operations of passing user authentication information from the computer system to the data communications device to allow the data communications device to authorize the internet protocol communications session.

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34. The computer system of claim 33 wherein when the connection process causes the computer system to perform the operation of providing, to the data communications device, first packet communications session authentication information, the data communications device communicates with an user account computer system to verify if 25 the user of the computer system identified in the user authentication information is authorized to cause the data communications device to establish the first and second packet communications sessions from the computer system, through the data communications device, to the data storage system.

35. The computer system of claim 25 wherein when the connection process causes the computer system to perform the operation of establishing a second packet communications session from the data communications device to the data storage system, the connection process causes the computer system to perform the operation of:

5 providing, to the data communications device over the interface, second packet communications session connection information allowing the data communications device to initiate the second packet communications session from the data communications device to the data storage system;

10 receiving, over the interface, second packet communications session state information indicating a state of the second packet communication session between the data communications device and the data storage system.

36. The computer system of claim 35 wherein:

15 the second packet communications session connection information includes data storage system connection information associated with the data storage system and user authentication information of the user of the computer system; and

20 wherein when the connection process causes the computer system to perform the operation of providing the second packet communications session connection information to the data communications device, the data communications device performs the operations of:

initiating the second packet communications session from the data communications device to the data storage system on the computer network using the data storage system connection information;

25 providing the user authentication information to a remote access server associated with the data storage system to allow the remote access server to authorize the establishment of the second packet communications session from the data communications device to the data storage system;

receiving data storage system address information at the data communications device identifying an address of the data storage system to allow

the data communications device to establish the second packet communications session; and

forwarding second packet communications session state information to the interface in the computer system from the data communications device to allow the computer system to perform the operation of performing packet communications between with the computer system and data storage system using the first and second packet communications sessions.

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10 37. The computer system of claim 36 wherein the data storage system address information is a pre-configured network address assigned to the service processor associated with the data storage system.

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38. The computer system of claim 36 wherein:

15 the second packet communications session connection information includes data storage system connection information including an a phone number of a service processor modem associated with the service processor associated with the data storage system; and

20 wherein the connection process operation of initiating the second packet communications session from the data communications device to the data storage system causes the data communications device to instruct a modem to dial the phone number of a service processor modem in order to establish a dial up connection to the data storage system from the data communications device.

25 39. The computer system of claim 36 wherein:

the second packet communications session state information includes the data storage system address information and includes data storage system connection bandwidth information; and

30 wherein the data communications device operation of forwarding second packet communications session state information to the computer system from the data

communications device causes the data communications device to perform the operation of:

forwarding the second packet communications session state information to a network manager computer system coupled to the computer network which receives the second packet communications session state information and forwards routing information to the interface in the computer system so that the computer system can perform packet communications with the data storage system.

40. The computer system of claim 36 wherein when the connection process causes the computer system to perform the operation of performing packet communications between with the computer system and data storage system, the connection process causes the computer system to perform the operations of:

receiving, over the interface, the second packet communications session state information in response to the step of forwarding;

adjusting connection bandwidth associated with the first packet communications session on the interface to match connection bandwidth associated with the second packet communications session;

providing, over the interface, computer system address information to the data storage system so that the data storage system can establish a route to the computer system; and

using the first packet communications session between the computer system and the data communications device and the second packet communications session between the data communications device and the data storage system to perform packet communications between the computer system and the data storage system.

41. A data storage system comprising:

a processor;

an interface capable of coupling to a computer network;

a memory system associated with the processor encoded with a communication

application;

an interconnection mechanism coupling the processor, the interface and the memory system;

wherein, the processor performs the communication application as a communication process which causes the processor in the data storage system to 5 establishing a packet communications session with a computer system by performing the operations of:

receiving, over the interface, a request to initiate a packet communications session;

10 providing, over the interface, data storage system address information to an initiator of the request;

receiving, over the interface, computer system address information to allow the processor in the data storage system to perform packet communications with the computer system; and

15 establishing, over the interface, a packet communications session with the computer system based on the computer system address information.

42. The data storage system of claim 41 wherein:

the request to initiate a packet communications session includes user authentication information of a user of the computer system; and

20 wherein the communication process further causes the data storage system to perform the operation of authenticating an identity of the user based on the user authentication information in order to authorize the establishment of the packet communications session to the data storage system.

25 43. The data storage system of claim 42, wherein the communication process further causes the data storage system to perform the operation of:

in response to the operation of authenticating an identity of the user, the processor establishes a packet communications session with a data communications device from which the request to initiate a packet communications session originates.

44. The data storage system of claim 43 wherein:

the processor is a service processor in the data storage system;

the communication application is a service application;

the communication process is a service process;

5 the interface is a service processor modem; and

the data storage system address information is a pre-configured network address assigned to the service processor in the data storage system by a vendor of the data storage system.

10 45. The data storage system of claim 41 wherein:

the request to initiate a packet communications session is sent from a data communications device interconnected with the computer system; and

wherein when the communication process performs the operation of providing data storage system address information, the communication process causes the processor to provide a network address of the processor in the data storage system to the data communications device for receipt by the computer system to allow the computer system to perform packet communications to the data storage system.

15 46. The data storage system of claim 41 wherein when the communication process

20 performs the operations of establishing a packet communications session with the computer system, the communication process causes the processor to establish route information within the data storage system based on the computer system address information to allow the processor to perform packet communications with the computer system.

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47. A computer program product having a computer-readable medium including computer program logic instructions encoded thereon that when performed in a computer system, causes the computer system to establish a packet communications sessions to a data storage system, and wherein when the computer program logic is performed on a

processor in the computer system, the computer program logic causes the processor to perform the operations of:

receiving a request to establish a communications session with a data storage system;

5 establishing a first packet communications session from the computer system to a data communications device capable of communicating with the data storage system;

establishing a second packet communications session from the data communications device to a service processor associated with the data storage system; and

10 performing packet communications between with the computer system and data storage system using the first and second packet communications sessions.

48. The computer program product of claim 47 wherein the computer program logic that, when performed on the processor, causes the processor to perform the operation of receiving a request to establish a communications session with a data storage system , further includes instructions that, when performed on the processor, cause the processor to perform the operations of:

receiving user authentication information for a user of the computer system;

authenticating an identity of the user based on the user authentication information;

20 receiving a data storage system identity indicating an identity of the data storage system to which the packet communications session is to be established.

49. The computer program product of claim 47 wherein the computer program logic that, when performed on the processor, causes the processor to perform the operation of

25 establishing a first packet communications session from the computer system to a data communications device capable of communicating with the data storage system, further includes instructions that, when performed on the processor, cause the processor to perform the operations of:

obtaining connection information for a data communications device that is

30 capable of communicating with the data storage system;

initiating the first packet communications session from the computer system to a data communications device using the connection information for the data communications device;

providing, to the data communications device, first packet communications session authentication information such that the data communications device can determine if a user of the computer system is authorized to establish the first packet communications session; and

if the user of the computer system is authorized to establish the first packet first packet communications session, allowing the computer system to perform the step of establishing a second packet communications session from the data communications device to the data storage system; and

if the user of the computer system is not authorized to establish the first packet first packet communications session, denying the ability of the computer system to perform the step of establishing a second packet communications session from the data communications device to the data storage system.

50. The computer program product of claim 47 wherein the computer program logic that, when performed on the processor, causes the processor to perform the operation of establishing a second packet communications session from the data communications device to the data storage system further includes instructions that, when performed on the processor, cause the processor to perform the operations of:

providing, to the data communications device, second packet communications session connection information allowing the data communications device to initiate the second packet communications session from the data communications device to the data storage system;

receiving second packet communications session state information indicating a state of the second packet communication session between the data communications device and the data storage system.

51. The computer program product of claim 50 wherein the data storage system address information is a pre-configured network address assigned to the service processor associated with the data storage system.
- 5 52. The computer program product of claim 47 wherein the computer program logic that, when performed on the processor, causes the processor to perform the operation of performing packet communications between with the computer system and data storage system further includes instructions that, when performed on the processor, cause the processor to perform the operations of:
- 10 receiving the second packet communications session state information in response to the step of forwarding;
- adjusting connection bandwidth associated with the first packet communications session to match connection bandwidth associated with the second packet communications session;
- 15 providing computer system address information to the data storage system so that the data storage system can establish a route to the computer system; and
- using the first packet communications session between the computer system and the data communications device and the second packet communications session between the data communications device and the data storage system to perform packet
- 20 communications between the computer system and the data storage system.

53. A computer program product having a computer-readable medium including computer program logic encoded thereon that when performed in a data storage system, causes the data storage system to establish a packet communication sessions to a computer system, and wherein when the computer program logic is performed on a processor in the data storage system, the computer program logic causes the processor to perform the operations of:

receiving a request to initiate a packet communications session;

providing data storage system address information to an initiator of the request;

receiving computer system address information to allow the processor in the data storage system to perform packet communications with the computer system; and  
establishing a packet communications session with the computer system based on the computer system address information.

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54. The computer program product of claim 53 wherein:

the request to initiate a packet communications session includes user authentication information of a user of the computer system; and

wherein the computer program logic further includes instructions that, when performed on the processor, cause the processor to perform the operation of authenticating an identity of the user based on the user authentication information in order to authorize the establishment of the packet communications session to the data storage system.

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15 55. The computer program product of claim 53 wherein the processor is a service process in the data storage system and the data storage system address information is a pre-configured network address assigned to the service processor associated with the data storage system by a vendor of the data storage system.

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56. A system for establishing packet communications between a computer system and a data storage system, the system comprising:

a vendor computer network including at least one computer system and at least one data communications device capable of communicating with a computer network other than the vendor computer network;

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the computer system equipped with a connection application that when performed as a connection process in the computer system causes the computer system to perform the operations of:

receiving a request to establish a communications session with a data storage system;

establishing a first packet communications session from the computer system to a data communications device capable;

establishing a second packet communications session from the data communications device to a data storage system located on the computer network other than the vendor computer network; and

5 performing packet communications between with the computer system and data storage system using the first and second packet communications sessions.

57. The system of claim 56 wherein:

10 the computer network other than the vendor computer network is a customer computer network;

the data storage system is coupled to the customer computer network;

15 the connection process is operated by a vendor support engineer in order to provide remote support to the data storage system on the customer computer network; and

20 the second packet communications session is established from the data communications device to a service processor associated with the data storage system to allow the support engineer operating the connection process to remotely maintain the data storage system using the first and second packet communications sessions.

58. The system of claim 57 further including:

within the vendor computer network, means for authenticating an identity of the support engineer and authorizing the establishment of the first packet communications session;

25 means for authenticating an identity of the support engineer and authorizing the establishment of the second packet communications session.